

What is claimed is:

1. A method of carbon allotropes synthesis for use in a hot plasma zone of arc discharge plasma apparatus comprising the steps of:
selecting consumable and non consumable electrodes wherein at least one of said electrode having at least one longitudinal inner channel for delivering of a buffer gas outflow, feedstock material and catalyst to between electrode gap;
continuous feeding to the hot plasma zone the consumable electrode, feedstock material and catalyst admixed with the buffer gas outflow injected through the longitudinal inner channel of the electrode;
forming in the hot plasma zone a vapor from consumed materials;
removing from the hot plasma zone by the radial buffer gas outflow the produced vapor for quenching and condensing ; and
forming and collecting of carbon allotropes contained soot.
2. The method as defined in claim 1, wherein the said continuous feeding of selected electrode, feedstock material and catalyst into the hot plasma zone is performed by moving of at least one consumable electrode towards the said hot plasma zone.
3. The method as defined in claim 1, wherein said consumable and non consumable electrodes used with DC current for developing a hot plasma zone periodically, during operation, for complete elimination of carbon deposit occurred on cathode are assigned alternative functions by temporarily switching a polarity of said electrodes.
4. A method as defined in claim 1, wherein said inert gas selected from the group consisting of helium only, mixture of helium with up to 20% of argon, and mixture of helium with up to 10% of nitrogen.
5. The method as defined in claim 1, wherein the said vapor being removed from the hot plasma zone to a volume of reaction vessel by force of buffer gas outflow for increasing productivity, yield and completely eliminating a cathode deposit.
6. The method as defined in claim 1, wherein a produced carbon soot contains at least one molecule of fullerene and/or at least one carbon nanotube.
7. A DC arc discharge plasma apparatus for fullerenes and nanotubes synthesis comprising :
a water cooled reaction vessel,

an electrode system sealed in said reaction vessel,
wherein said electrode system having anode and cathode with at least one
longitudinal inner channels therein for creating buffer gas outflow, feeding feedstock
and catalyst through said longitudinal inner channels to a hot plasma zone and also
for removing of produced vapor from the hot plasma zone by said buffer gas outflow.

8. The DC arc discharge plasma apparatus for fullerenes and nanotubes synthesis
according to claim 7 further comprising :

a device for alternative temporarily changing polarity of electrodes during operation
for removing cathode deposit.

9. The DC arc discharge plasma apparatus for fullerenes and nanotubes synthesis,
according to claim 7, further comprising a filtration and gas re-circulation means to
separate carbon soot from inert gas .

10. The DC arc discharge plasma apparatus according to claim 7, wherein said anode
and cathode have different cross sectional areas comprising differently assembled
blocks, said blocks shape consisting of rods, bars and rods and bars, where said rods,
bars and rods and bars are assembled in tight contact along longitudinal sides to form
inner longitudinal channel.

11. The DC arc discharge plasma apparatus according to claim 7, wherein said
cathode comprising distal end with outlet holes, said distal end with outlet holes being
connected with said longitudinal inner channel to uniformly distribute buffer gas
outflow in the hot plasma zone.

12. The cathode of the said electrode system according to claim 7, wherein said
cathode comprising an additional peripheral annular gas channel to block a side
carbon deposit on a cathode surface.

13. The apparatus according to claim 11, wherein said outlet holes in order to
improve gas dynamic of the gas outflow injected into the hot plasma zone have a
specially shaped chamfered, fillet or cylindrically straight hole ends.

14. The apparatus as defined in claim 10, wherein said block assembled anode has
inserts of metallic catalytic wires or strips.

15. The DC arc discharge plasma apparatus for fullerenes and nanotubes synthesis according to claim 7 wherein said electrode system in order to achieve maximum productivity and optimal yield should allow to maintain a ratio by mass between buffer gas outflow rate and anode evaporation rate within 1 to 10.
16. A DC arc discharge plasma apparatus for fullerenes and nanotubes synthesis comprising :
 - a water cooled reaction vessel;
 - an electrode system sealed in said reaction vessel;
 - wherein said electrode system having anode and cathode with at least one longitudinal inner channels therein for creating buffer gas outflow, feeding feedstock and catalyst through said longitudinal inner channels to a hot plasma zone and also for removing of produced vapor from the hot plasma zone, wherein said cathode comprising an additional peripheral annular gas channel to block a side carbon deposit on a cathode surface and wherein said cathode comprising distal end with outlet holes, said distal end with outlet holes being connected with said longitudinal inner channel to uniformly distribute buffer gas outflow in the hot plasma zone;
 - a feeding system to provide continuous consumption of anode and inflow of feedstock and catalyst admixed with buffer gas outflow;
 - a device for alternative change of electrodes polarity;
 - a filtration and gas re-circulation means to separate carbon soot from inert gas;
 - and a device for inclination of reaction vessel with respect to vertical position;
17. The DC arc discharge plasma apparatus according to claim 16, wherein said reaction vessel being mounted pivotably on a stationary support for said reaction vessel inclination around horizontal axis up to 120 degree with respect to vertical position.